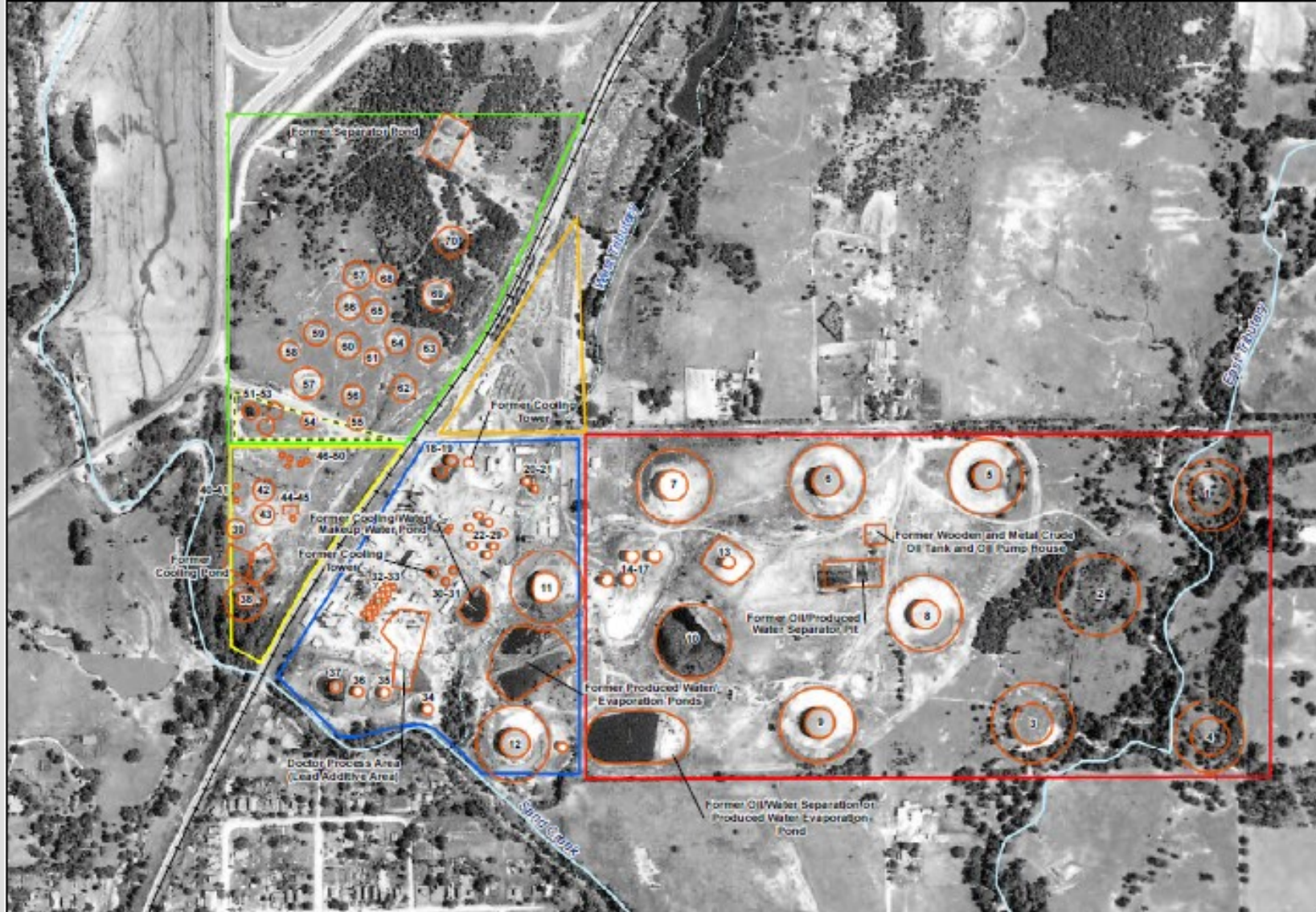
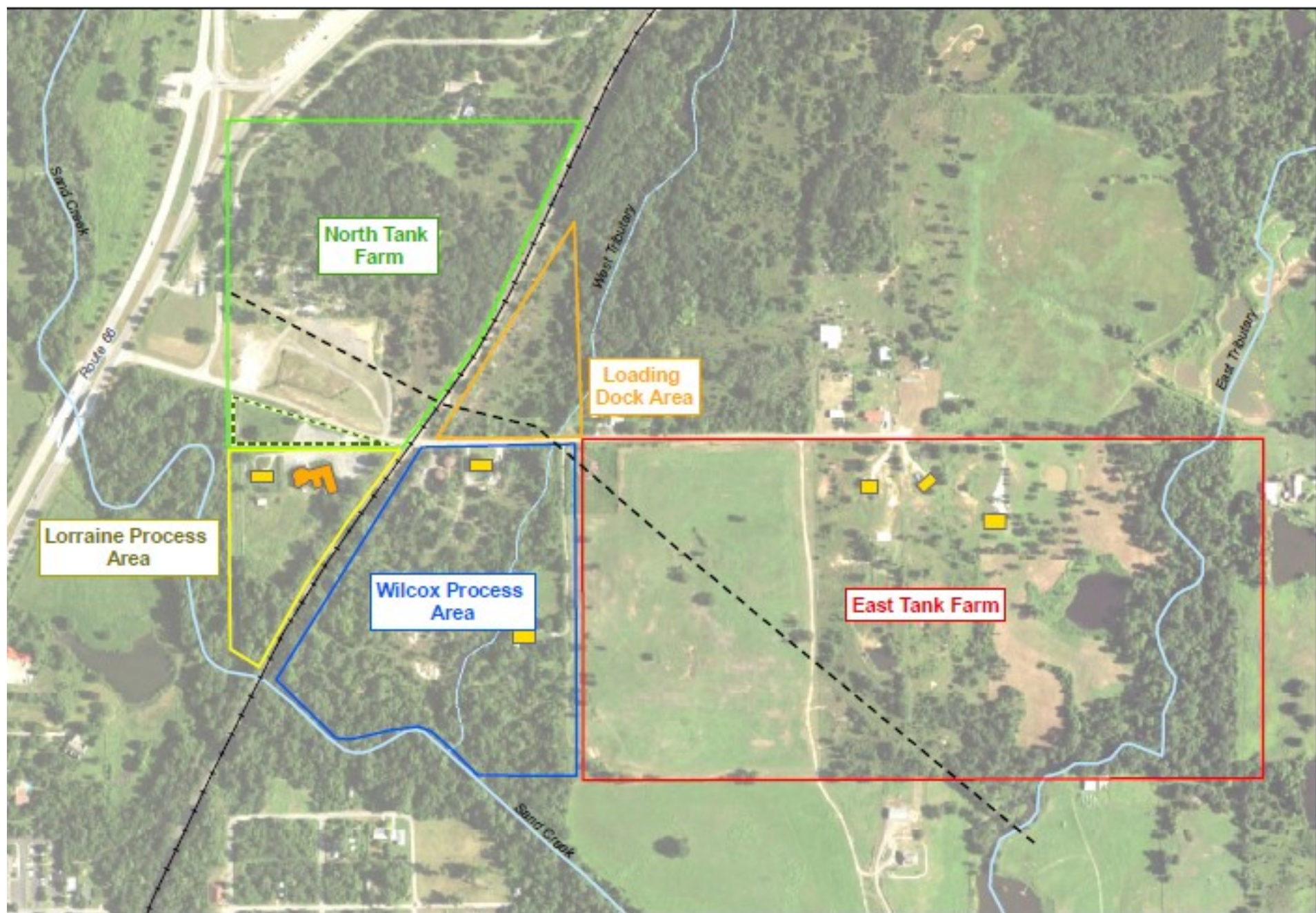


Wilcox Oil Risk Assessment Meeting





Wilcox Sampling Summary

Event 1 (August 2016)

- Completion of a passive soil gas survey.

Event 2 (September 2016)

- Performance of a site reconnaissance;
- Completion of a Wetlands Survey for Sand Creek;
- Collection of groundwater samples from 11 nearby private water wells;
- Collection of 12 vapor intrusion samples from Church, Parsonage, and White properties

Event 3 (October 2016)

- Initiated direct push technology (DPT) soil investigation; and provided support to EPA for collection of surface water samples at 11 locations along Sand Creek.

Event 4 (April 2017)

- Continued the DPT soil investigation

Event 5 (October 2017)

- Continued the DPT soil investigation
- Sediment and surface water sampling investigation.
- Excavated test pits and collected waste characterization samples

Event 6 (March 2018)

- Continued the DPT soil investigation and
- Collected waste characterization samples at the lead additive area situated at the Wilcox Process Area.

Event 7 (November 2018)

- Continued the DPT soil investigation
- Completed the installation and development of six groundwater monitoring wells at the Lorraine Process Area and Wilcox Process Area.

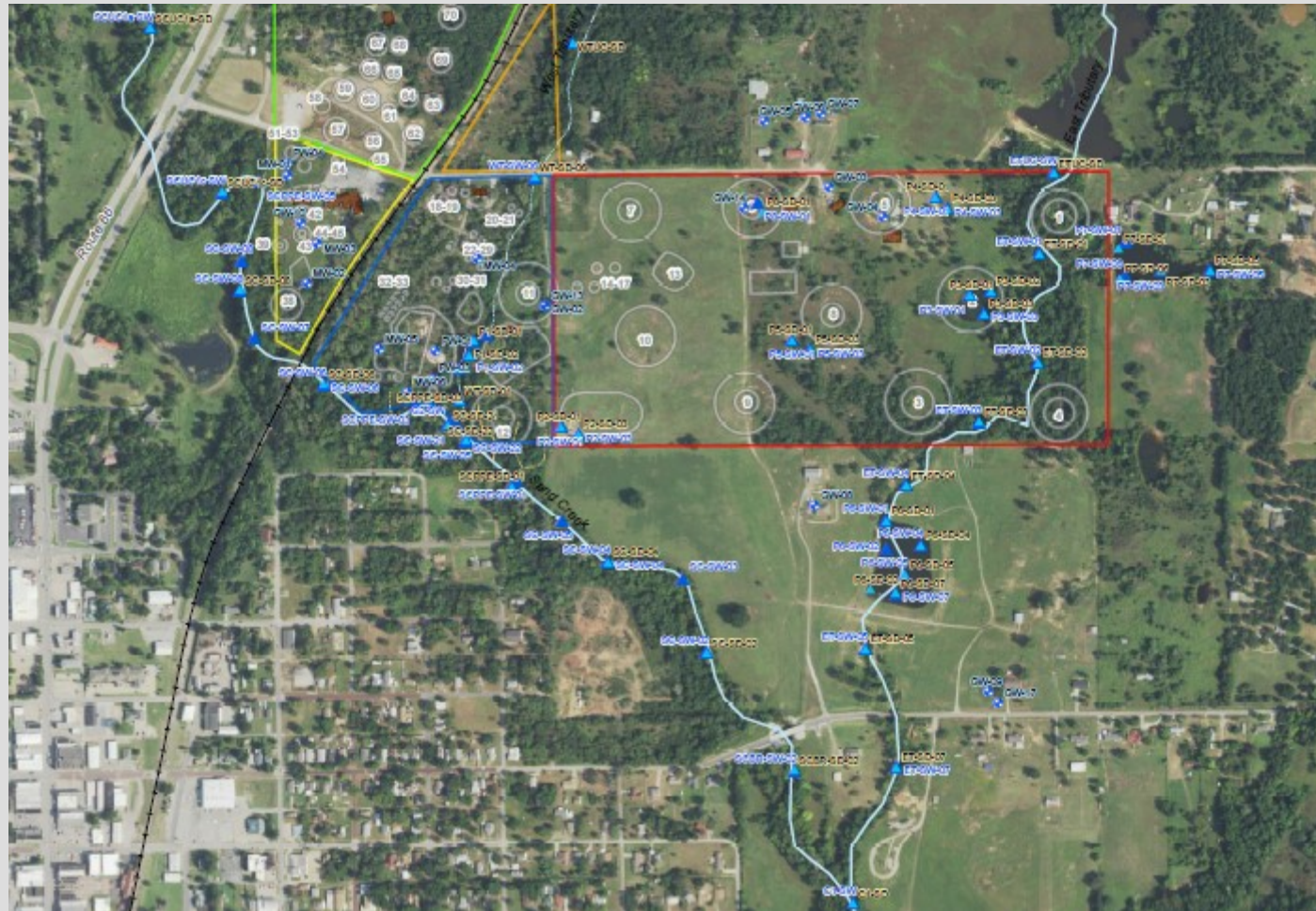
Event 8 (December 2018)

- Completed the DPT soil investigation
- Collected groundwater samples from 11 private water wells, the six new groundwater monitoring wells, and two existing piezometers.
- Collected surface water and sediment samples from two locations in Sand Creek, near the confluence with the west tributary of Sand Creek.

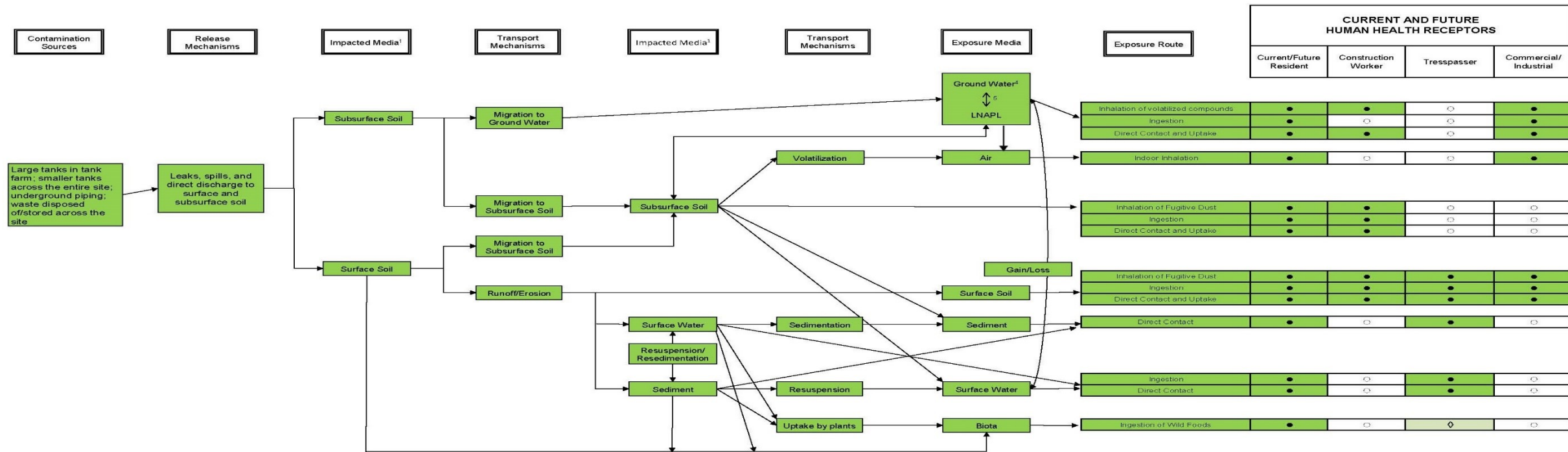
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Groundwater, Surface Water, and Sediment Sample Locations



Human Health Preliminary Conceptual Site Model



Preliminary Human Health Summary

- Based on maximum detected concentrations.
- Waste samples (e.g. WC, TP, and PT), including anticipated removal areas were not considered.
- 2019 sample additions did not significantly change previous reported concentrations.
- Surface water and sediment were evaluated on a site-wide basis.
- Groundwater evaluated on a site-wide basis and monitoring wells and private wells were combined.
- Soil was evaluated based on the five exposure areas (East Tank Farm, Loading Dock Area, Lorraine Process Area, North Tank Farm, and Wilcox Process Area).
- Surface (0-2 ft bgs) and subsurface soil evaluated separately.
- Piezometer samples were not evaluated, although a qualitative discussion about these samples for construction workers (and other receptors if appropriate) will be presented.

Preliminary Human Health Results

- Acceptable risk for surface water and sediment.
- Groundwater shows risk from arsenic, BTEX, and naphthalene. MW-04 and GW-10 (abandoned April 2017) exhibited the highest concentrations.
- Soil Results
 - ◆ East Tank Farm: Surface soil only, PAHs (primarily BaP) for residential receptors and lead.
 - ◆ Loading Dock Area: Acceptable risk.
 - ◆ Lorraine Process Area: Acceptable risk with the exception of lead.
 - ◆ North Tank Farm: Acceptable risk.
 - ◆ Wilcox Process Area: Surface and subsurface soil, PAHs (primarily BaP) for residential receptors and lead.

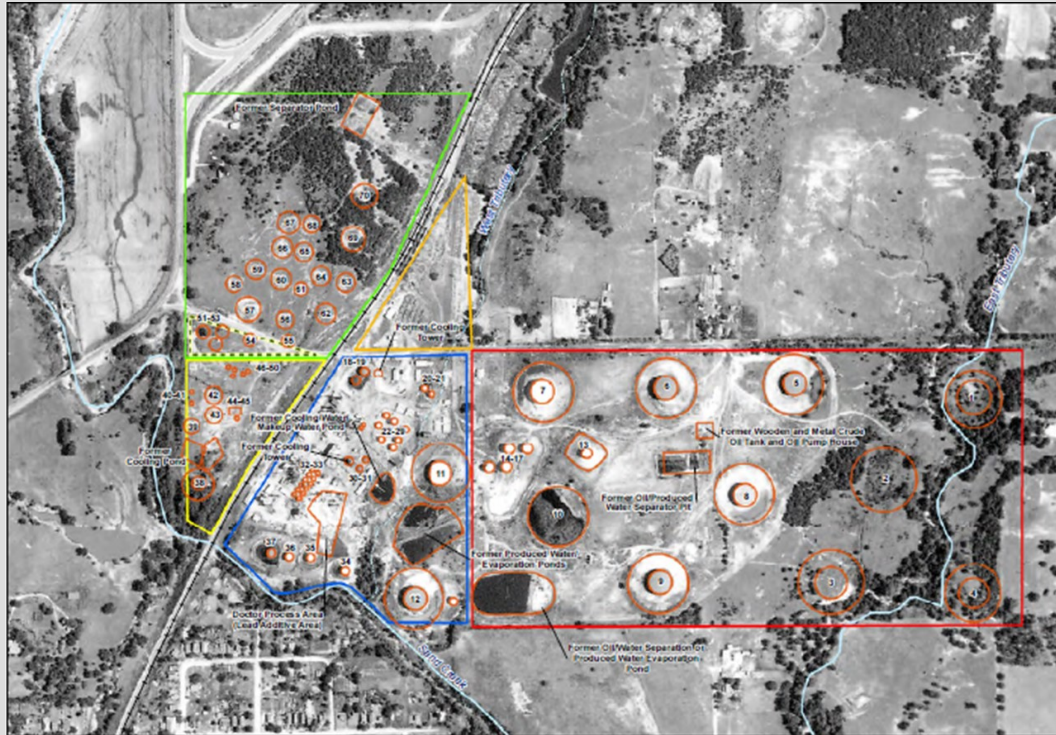
Preliminary Human Health Cleanup Goals

■ Benzo(a)pyrene (BaP)

- ◆ In selected areas, widespread concentrations > 1 mg/kg.
- ◆ Considering a goal of 5 mg/kg (equivalent to a residential cancer risk of 5×10^{-5}) because it is expected that this would result in an area-wide 95UCL of below or near 1 mg/kg.
- ◆ Expected that this would result in acceptable risk levels for both residents and workers.

■ Lead

- ◆ In selected areas, widespread concentrations > 400 mg/kg as well as > 800 mg/kg.
- ◆ Considering a goal of 1,000 mg/kg, which would
 - Result in acceptable risk to workers,
 - Residential lead risks may be close, particularly in the Wilcox Process Area.

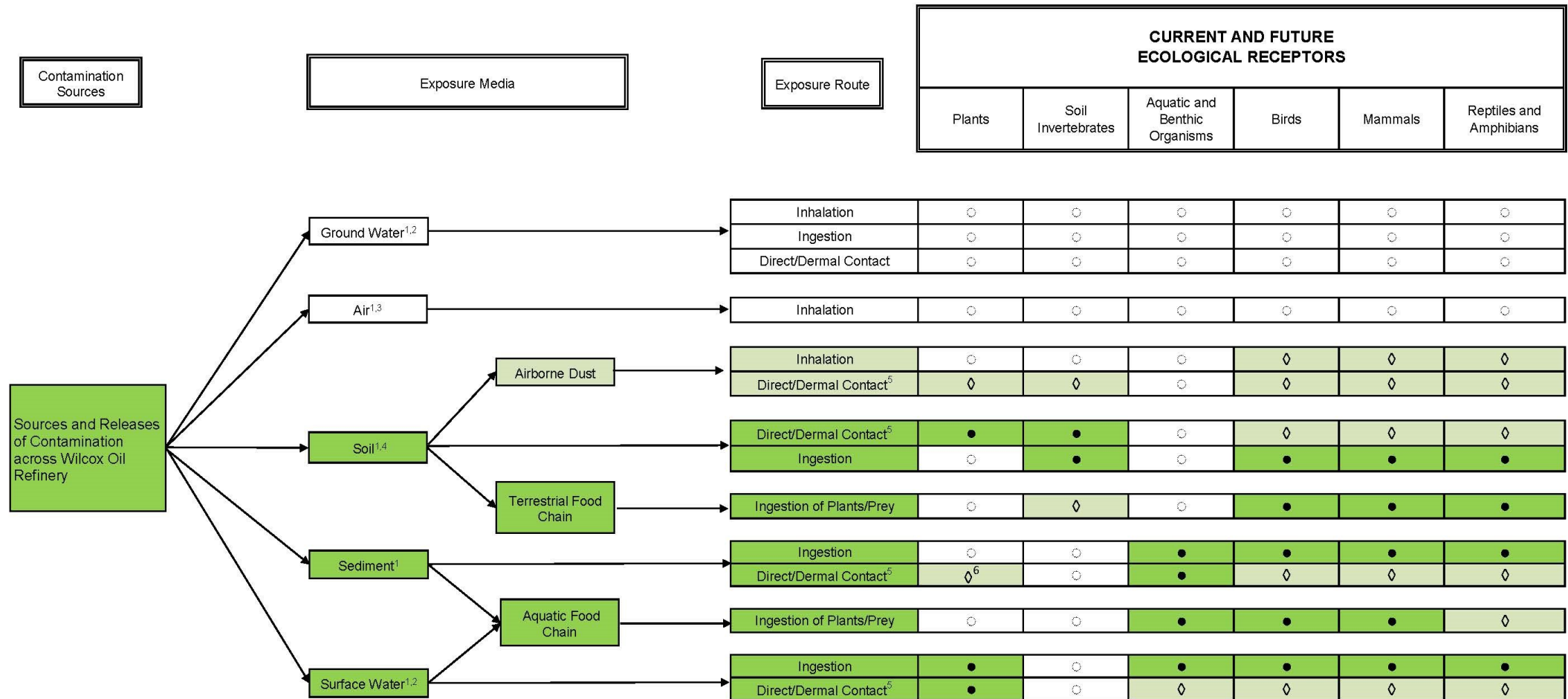


PRELIMINARY ECOLOGICAL RISK ASSESSMENT RESULTS

Ecological Assessment – General Considerations

- US Fish and Wildlife and Oklahoma National Heritage Inventory contacted for potential presence of Threatened and Endangered Species
- No known documentation of Threatened and Endangered species were identified.
- Therefore, the protection of populations of ecological receptors is the focus of the risk assessment.

Preliminary Ecological Conceptual Site Model



Ecological Risk Assessment General Approach

- Ponds were evaluated separately from streams to allow for isolation of contamination.
- Surface soil was evaluated from 0-2 ft bgs
 - ◆ WPA/LPA are combined
 - ◆ NTF, LDA, and ETF combined

Ecological Assessment - Aquatic Receptors

Ecological assessment endpoints include protection of the following populations:

- Wetland and Aquatic Plants
- Aquatic and Benthic Organisms
- Aquatic Herbivorous Mammals
 - ◆ Muskrat (*Ondatra zibethicus*)
- Aquatic Herbivorous Birds
 - ◆ Canada goose (*Branta canadensis*)
- Aquatic Piscivorous Mammals
 - ◆ River otter (*Lutra canadensis*)
- Aquatic Piscivorous Birds
 - ◆ Great Blue Heron (*Ardea herodias*)
 - ◆ **Green Heron** (*Butorides virescens*)
- Reptiles and Amphibians
 - ◆ American Bullfrog (*Rana catesbeiana*)
 - ◆ Glossy crayfish snake (*Regina rigida*)



Ecological Assessment – Terrestrial Receptors

Ecological assessment endpoints include protection of the following populations:

- Terrestrial Plants
- Soil Invertebrates
- Terrestrial Herbivorous Mammals
 - ♦ White-footed mouse (*Peromyscus leucopus*)
- Terrestrial Herbivorous Birds
 - ♦ Song sparrow (*Melospiza melodia*)
- Terrestrial Insectivorous Mammals
 - ♦ Southern short tailed shrew (*Blarina carolinensis*)
- Terrestrial Insectivorous Birds
 - ♦ American Robin (*Turdus migratorius*)
- Predatory Mammals
 - ♦ Red Fox (*Vulpes vulpes*)
- Predatory Birds
 - ♦ Red-tailed hawk (*Buteo jamaicensis*)
- Domesticated Mammals
 - ♦ Beef Cattle



Ecological Assessment - Preliminary Background Screening

- Maximum detections in surface soil were compared to maximum background concentrations. Metals exceeding background will be carried through risk assessment.
- Aluminum and iron concentrations will be ruled out due to pH

- North Tank Farm, East Tank Farm, and Loading Area
 - ◆ Highest maximum concentrations compared to background are lead and zinc
 - ◆ Barium, cadmium, copper, manganese, and nickel maximum results are at least 10 times the background concentrations.

- Process Areas
 - ◆ Highest maximum concentrations compared to background are copper, lead, and zinc
 - ◆ Arsenic, cadmium, and mercury maximum results are at least 10 times the background concentrations.

Ecological Assessment – Preliminary Background Screening

■ Ponds

- ◆ Maximum detections in ponds were compared to maximum background concentrations.
- ◆ Background sediment and surface water collected upstream of the site
- ◆ Sediment
 - Highest sediment concentrations are located in Ponds 1 and 6
 - Highest sediment concentrations compared to background is hexavalent chromium
 - Other metal concentrations are 2 to 3 times background concentrations
- ◆ Surface Water
 - Highest surface water concentrations are generally located in Pond 2
 - Barium is present in surface water at approximately 5 times the background concentration
 - Other metal concentrations are 2 to 3 times background concentrations

Ecological Assessment – Preliminary Background Screening

■ Streams

- ◆ Maximum detections in streams were compared to maximum background concentrations.
- ◆ Background sediment and surface water collected upstream of the site
- ◆ Sediment
 - Highest sediment concentrations are generally located in Sand Creek
 - Lead is present in sediment at approximately 7 times the background concentration
 - Other metal concentrations are 2 to 3 times background concentrations
- ◆ Surface Water
 - Highest surface water concentrations are generally located in Sand Creek
 - Barium is present in surface water at approximately 5 times the background concentration
 - Other metal concentrations are 2 to 3 times background concentrations

Preliminary Ecological Risk Assessment Drivers

- Metals are the driver site wide
 - ◆ Lead, cadmium, copper, zinc and mercury.
 - ◆ Other metals tend to be co-located with the high lead concentrations.
 - ◆ HH considering a goal of 1,000 mg/kg for lead
 - Results in an unacceptable risk to ecological receptors,
 - 400 mg/kg would likely result in acceptable risk levels
- High molecular weight PAHs – secondary driver
 - ◆ Eco SSL 1.1 mg/kg
 - ◆ NOAEL used to derive the Eco-SSL is 0.615 mg/kg bw/day
 - ◆ Corresponding LOAEL is 3.07 mg/kg bw/day, approximately 5 times the NOAEL
 - ◆ Preliminary screening level of 5.5 mg/kg, which is approximately 5 times the EcoSSL
 - ◆ Similar to the proposed HH goal of 5 mg/kg.